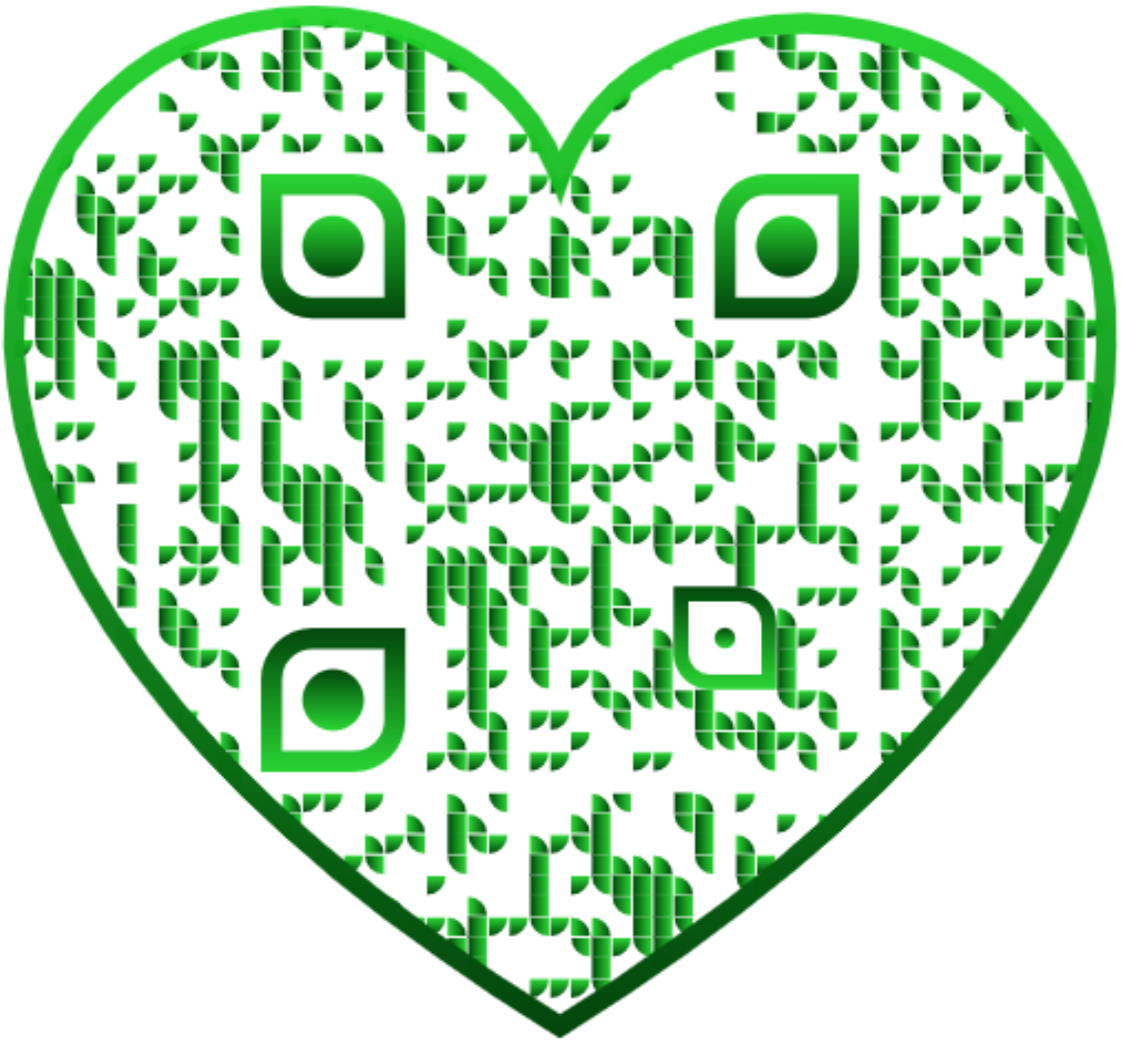
Clinical Practice Guideline by Infectious Diseases Society of America (IDSA): 2025 Guideline on Management and Treatment of Complicated Urinary Tract Infections

Barbara W. Trautner,[1] Nicolás W. Cortés-Penfield,[2] Kalpana Gupta,[3] Elizabeth B. Hirsch,[4] Molly Horstman,[5] Gregory J. Moran,[6] Richard Colgan,[7] John C. O'Horo,[8] Muhammad S. Ashraf,[9] Shannon Connolly,[10] Dimitri Drekonja,[11] Larissa Grigoryan,[12] Angela Huttner,[13] Gweneth B. Lazenby,[14] Lindsay Nicolle,[15] Anthony Schaeffer,[16] Sigal Yawetz,[17] Valéry Lavergne,[18,19]

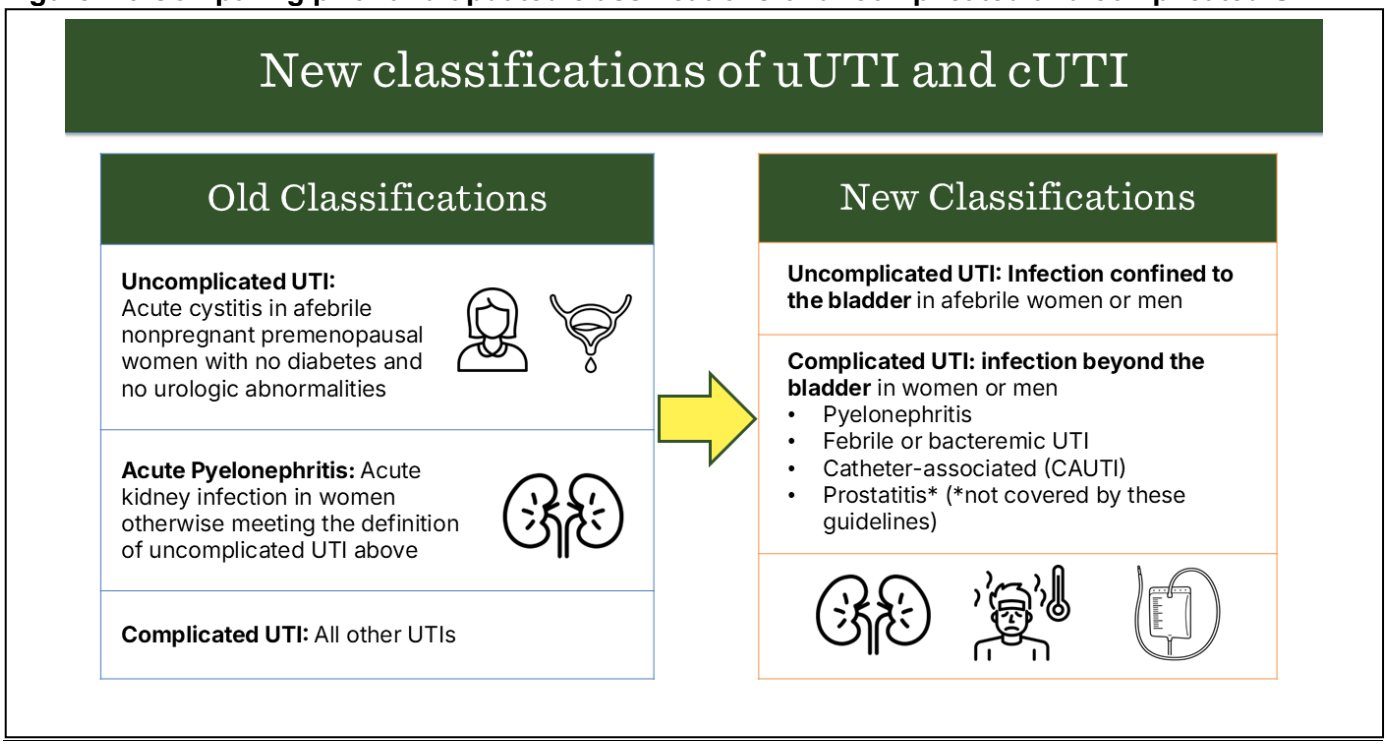
[1] Division of Infectious Diseases, Department of Medicine, Washington University School of Medicine, St. Louis, MO, [2]Division of Infectious Diseases, University of Nebraska Medical Center, Omaha, NE, USA, [3]Section of Infectious Diseases, Boston VA Health Care System, Boston University School of Medicine, Boston, MA, USA, [4]Department of Experimental and Clinical Pharmacology, University of Minnesota College of Pharmacy, Minneapolis, MN, USA, [5]Center for Innovations in Quality, Effectiveness, and Safety, Michael E. DeBakey VA Medical Center, Department of Medicine, Baylor College of Medicine, Houston, TX, USA, [6]Professor of Clinical Emergency Medicine, David Geffen School of Medicine at UCLA, Olive View-UCLA Medical Center, Los Angeles, CA, USA, [7]Department of Family and Community Medicine, University of Maryland School of Medicine, Baltimore, MD, USA, [8]Division of Public Health, Infectious Diseases and Occupational Medicine, Mayo Clinic, Rochester, MN, USA, [9]Division of Infectious Diseases, Department of Internal Medicine, University of Nebraska Medical Center, Omaha, NE, USA, [10]Associate Medical Director, Planned Parenthood of Orange and San Bernardino Counties, Orange, CA, USA, [11]Infectious Disease Section, Minneapolis VA Health Care System, University of Minnesota Medical School, Minneapolis, MN, USA, [12]Department of Family and Community Medicine, Baylor College of Medicine, Houston, TX, USA, [13]Division of Infectious Diseases, Geneva University Hospitals and Faculty of Medicine, Geneva, Switzerland, [14]Departments of Obstetrics and Gynecology and Medicine Division of Infectious Diseases, Medical University of South Carolina, Charleston, SC, USA, [15]Faculty of Health Sciences, University of Manitoba School of Medicine, Winnipeg, Manitoba, Canada, [16]Department of Urology, Feinberg School of Medicine Northwestern University, Chicago, IL, USA, [17]Division of Infectious Diseases, Brigham and Women's Hospital, Boston, MA, USA, [18]Division of Medical Microbiology and Infection Control, Department of Pathology & Laboratory Medicine, Vancouver General Hospital, University of British Columbia, Vancouver, BC, Canada, [19]Department of Clinical Affairs and Practice Guidelines, Infectious Diseases Society of America (IDSA), Arlington, VA, USA

EXECUTIVE SUMMARY



Updated classifications of uncomplicated and complicated urinary tract infections (UTIs)

Figure 1.0 Comparing prior and updated classifications of uncomplicated and complicated UTI


New classifications of uUTI and cUTI
Old Classifications
Uncomplicated UTI: Acute cystitis in afebrile nonpregnant premenopausal women with no diabetes and no urologic abnormalities
Acute Pyelonephritis: Acute kidney infection in women otherwise meeting the definition of uncomplicated UTI above
Complicated UTI: All other UTIs
New Classifications
Uncomplicated UTI: Infection confined to the bladder in afebrile women or men
Complicated UTI: infection beyond the bladder in women or men
• Pyelonephritis
• Febrile or bacteremic UTI
• Catheter-associated (CAUTI)
• Prostatitis* (*not covered by these guidelines)

Box 1: Complicated UTI classifications for guidelines purposes (intended to guide treatment not diagnosis)

- Clinical presentation:
  - Complicated UTI is accompanied by symptoms which suggest an infection extending beyond the bladder, including:
    - Fever
    - Other signs or symptoms of systemic illness (including chills, rigors, or hemodynamic instability)
    - Flank pain
    - Costovertebral angle tenderness
  - Pyelonephritis is encompassed in complicated UTI.
  - UTI with systemic symptoms associated with transurethral, suprapubic, or intermittent catheterization is encompassed in complicated UTI.
- Populations:
  - Patients with complicated UTIs may have an indwelling urinary catheter, neurogenic bladder, urinary obstruction, or urinary retention as an underlying condition.
  - These guidelines are not intended to apply to bacterial prostatitis, epididymitis, or orchitis.

Box 2: Uncomplicated UTI classifications for guidelines purposes (intended to guide treatment, not diagnosis)

- Clinical presentation:
  - A clinical syndrome characterized by local bladder signs and symptoms such as dysuria, urgency, frequency, and suprapubic pain.
  - Uncomplicated UTI is presumed to be confined to the bladder and is defined by absence of signs or symptoms which suggest an infection extending beyond the bladder:
    - No fever, unless explained by a non-UTI cause
    - No other signs or symptoms of systemic illness (including chills, rigors, or unstable vital signs), unless explained by a non-UTI cause
    - No flank pain
    - No costovertebral angle tenderness
- Populations:
  - Uncomplicated UTI can occur in females or males, patients with underlying urologic abnormalities, patients with immunocompromise, and persons with diabetes. Recurrent UTI can be uncomplicated.
  - Patients with urinary catheters (including transurethral, suprapubic, and intermittent catheterization), stents, and percutaneous nephrostomy tubes generally do not have uncomplicated UTI.
  - These guidelines are not intended to apply to bacterial prostatitis, epididymitis, or orchitis.

Selection of Antibiotic Therapy for Complicated UTI

A. Initial Selection among Empiric Antibiotic Options for Complicated UTI

In patients with cUTI, which classes of empiric antibiotic therapy should initially be prioritized?

Recommendations:

a) For patients with **sepsis** due to complicated UTI, we suggest **initially selecting among** the following antibiotics, using the four-step assessment (**Figure 1.1**): third- or fourth-generation cephalosporins, carbapenems, piperacillin-tazobactam, or fluoroquinolones, rather than newer agents (novel beta lactam-beta lactamase inhibitors, cefiderocol, plazomicin) or older aminoglycosides (*conditional recommendation, very low to moderate certainty of evidence*).

Remarks:
-See **Table 1.1** for a more complete list of empiric antibiotic therapy options.
-Please refer to the four-step approach in **Figure 1.1** to choose among these antibiotics for the specific patient (i.e., severity of illness, risk factors for having resistant uropathogen, patient-specific considerations, and antibiogram).
-Agents with broader spectrum of activity against organisms other than Enterobacterales (e.g. *Pseudomonas aeruginosa*, enterococci, or methicillin-resistant *Staphylococcus aureus*) may be considered for patients with sepsis in whom the diagnosis of cUTI is not clear or who are suspected to have cUTI due to these pathogens.

Comments:
-This recommendation places a higher value on providing early, appropriate empiric antibiotic therapy to prevent mortality while deferring stewardship considerations to definitive therapy.
- The certainty of evidence was moderate for all classes of antibiotics, except for third and fourth generation cephalosporins, and older aminoglycosides, for which the certainty of evidence was very low.

b) For patients with suspected complicated UTI without sepsis, we suggest **initially selecting among** the following antibiotics, using the four-step assessment (**Figure 1.1**): third- or fourth-generation cephalosporins, piperacillin-tazobactam, or fluoroquinolones, rather than carbapenems and newer agents (novel beta lactam-beta lactamase inhibitors, cefiderocol, plazomicin) or older aminoglycosides (*conditional recommendation, very low to moderate certainty of evidence*).

Remarks:
-See **Table 1.1** for a more complete list of empiric antibiotic therapy options.
-Please refer to the four-step approach in **Figure 1.1** to choose among these antibiotics for the specific patient (i.e., severity of illness, risk factors for having resistant uropathogen, and patient-specific considerations).
-Other agents (e.g., trimethoprim-sulfamethoxazole, amoxicillin-clavulanate, first or second-generation cephalosporins) are less well studied but may be appropriate in select settings or situations for empiric oral treatment of cUTI.

Comments:
-This recommendation places a higher value on antibiotic stewardship considerations in patients with cUTI who are not septic and in whom the risk of infection-related mortality is low while also considering costs, resources, and practical aspects of antibiotic administration
-The certainty of evidence was moderate for all classes of antibiotics, except for third and fourth generation cephalosporins and older aminoglycosides, for which the certainty of evidence was very low.

Table 1.1: Potential Empiric Antibiotics for cUTI^ prior to using the four-step approach to choose among these options

Four-Step Approach to choose among these antibiotics: Assess (1) severity of illness, (2) risk factors for resistance, (3) patient-specific considerations, and (4) if septic, consider the antibiogram. See discussion below for details of the four steps.

Condition of the Patient	Preferred	Alternative
Sepsis with or without shock**	Third or fourth generation cephalosporins,* carbapenems,[#] piperacillin-tazobactam, fluoroquinolones[&]	Novel beta lactam-beta lactamase inhibitors,[+] cefiderocol, plazomicin, or older aminoglycosides[%]
Without sepsis, IV route of therapy	Third or fourth generation cephalosporins,* piperacillin-tazobactam, or fluoroquinolones[&]	Carbapenems,[#] newer agents (novel beta lactams-beta lactamase inhibitors,[+] cefiderocol, plazomicin), or older aminoglycosides[%]
Without sepsis, oral route of therapy	Fluoroquinolones[&] or trimethoprim-sulfamethoxazole	Amoxicillin-clavulanate or oral cephalosporins (see **Table 3.1**)

^Difficult-to-treat resistant pathogens may require use of drugs not listed here (e.g., colistin); refer to IDSA Antimicrobial Resistance guidance.
**Sepsis is life-threatening organ dysfunction related to infection, identified by SOFA score of 2 or higher. Screening tools such as qSOFA or SIRS may be useful for presumptive identification. In sepsis with shock, in step 4 choose an antibiotic for which the susceptibilities of the most relevant organisms are at least 90%. In sepsis without shock, in step 4 choose an antibiotic for which the susceptibilities of the most relevant organisms are at least 80%.
*Third and fourth generation IV cephalosporins include: ceftriaxone, ceftazidime, cefotaxime, and cefepime. (see **Table 2.1 & 3.1**, Dosing of IV and oral antibiotics for cUTI).
[&]The fluoroquinolones approved for UTI currently include ciprofloxacin and levofloxacin.
[#]The carbapenems currently include imipenem-cilastatin, doripenem, meropenem, and ertapenem.
+The novel beta lactam-beta lactamase inhibitors currently include ceftolozane-tazobactam, ceftazidime-avibactam, meropenem-vaborbactam, and imipenem-cilastatin-relebactam.
[%]Older aminoglycosides include gentamicin, amikacin, and tobramycin.

This table was created in 2025; new drugs approved after this date may also be appropriate choices.

Please note that nitrofurantoin and oral fosfomycin are generally not appropriate choices for cUTI because they may not achieve adequate levels in renal parenchyma and blood.

B. Process to Guide Empiric Antibiotic Choice for Complicated UTI

To optimize the selection of empiric antibiotic therapy for patients with suspected complicated UTI, we propose the following four-step approach: 1) assess the severity of illness (for initial prioritization of empiric antibiotic therapy), 2) consider patient-specific risk factors for resistant uropathogens (for optimization of coverage), 3) evaluate other patient-specific considerations (to reduce the risk of adverse events), and 4) for patients with sepsis, consult a relevant local antibiogram if available (to further improve the likelihood of giving appropriate empiric therapy in septic patients).

STEP 1: SEVERITY OF ILLNESS (initial prioritization of empiric antibiotic therapy)

In patients with suspected cUTI (including pyelonephritis), should selection of empiric antibiotic therapy be guided by severity of illness?

Recommendation:

I. For patients with suspected complicated UTI (including pyelonephritis), we suggest that the selection of empiric antibiotic therapy be initially guided by the severity of illness, specifically by whether the patient is in sepsis or not (*conditional recommendation, very low certainty of evidence*).

Remarks:
-Sepsis is defined per the Sepsis-3 Task Force as life-threatening organ dysfunction caused by a dysregulated host response to infection. These patients can be identified by SOFA score increase of 2 points or more, reflecting an in-hospital mortality greater than 10%, or presumptively identified with screening tools such as qSOFA or SIRS.[20,21]

STEP 2: PATIENT-SPECIFIC RISK FACTORS FOR RESISTANT UROPATHOGENS (optimization of coverage)

In patients with cUTI (including pyelonephritis), should selection of empiric antibiotic therapy be guided by patient-specific prior urine culture results and patient-specific risk factors for resistant uropathogens to optimize selection)?

Recommendations:

I. In patients with complicated UTI (including acute pyelonephritis), we suggest avoiding antibiotics to which the patient has had a resistant pathogen isolated from the urine previously (*conditional recommendation, very low certainty of evidence*)

Remarks:
-More recent urine cultures may be a better guide than more distant urine cultures.
-The time frame for paired cultures (urine samples collected from the same patient at different occasions) varied, but the median was 3-6 months.

II. In patients with complicated UTI (including acute pyelonephritis), we suggest avoiding fluoroquinolones if the patient has been exposed to that class of antibiotic in the past 12 months (*conditional recommendation, very low certainty of evidence).*

Remarks: More recent antibiotic exposure may be a better guide than more distant antibiotic exposure.

STEP 3: OTHER PATIENT-SPECIFIC CONSIDERATIONS (prevention of possible undesirable events)

In patients with cUTI (including pyelonephritis), should selection of empiric antibiotic therapy be further guided by patient-specific considerations?

Recommendation:

In patients suspected of cUTI, empiric antibiotic therapy selection should account for patient-specific considerations (e.g. risk of allergic reaction, contraindications, or drug-drug interactions) to avoid preventable adverse events (*good practice statement*).

STEP 4: ANTIBIOGRAM (tailoring empiric antibiotic therapy in septic patients)

In patients with cUTI (including pyelonephritis), should selection of empiric antibiotic therapy be further tailored by consulting an antibiogram?

Recommendations:

I. In patients with **sepsis** assumed to be caused by complicated UTI (including acute pyelonephritis), we suggest using an antibiogram to further tailor empiric antibiotic choice **only if** the antibiogram is local, recent, and relevant to the patient (*conditional recommendation, very low certainty of evidence*).

Remarks:

-An antibiogram is considered local if derived from the same healthcare facility, recent if based on data from the prior 12 months and relevant to the patient if based on organisms from a similar patient population.

-If an antibiogram is being used to further tailor empirical antibiotic choice, consider selecting an antibiotic for which 90% or more of the most relevant organism(s) are susceptible in patients in septic shock, or for which 80% or more of the most relevant organism(s) are susceptible in patients with sepsis without shock. These cutoffs are based on modeling of increased mortality risk associated with inappropriate empiric antibiotics in sepsis and septic shock.

-Septic shock is defined by the Sepsis-3 Task Force as a subset of sepsis in which despite volume resuscitation, vasopressors are required to maintain blood pressure and serum lactate level is greater than 2 mmol/L, reflecting an in-hospital mortality greater than 40%.[20,21]

II. For patients with suspected complicated UTI without sepsis (including acute pyelonephritis), we make no specific recommendation about using an antibiogram to further tailor empiric antibiotic choice (*no recommendation, knowledge gap*).

Remarks:

-Patients who are not septic have a lower risk of mortality from cUTI (less than or equal to 5%) and initial inappropriate empiric antibiotic choice has little impact on mortality. Routine use of broader-spectrum agents in suspected complicated UTI without sepsis may drive antimicrobial resistance without substantial patient benefit.

Table 2.1: Dosing of intravenous (IV) antibiotics for complicated UTI used in clinical studies presented in alphabetical order	
Drug	**Dosing regimen used in clinical trials for patients with normal renal function**
Cefepime	1-2g every 8 to 12 hours[1,2]
Cefepime-enmetazobactam	2g/0.5g (infused over 2 hours) every 8 hours[3]
Cefiderocol	2g (infused over 3 hours) every 8 hours[4,5]
Cefotaxime	1-2g every 8 hours[6]
Ceftazidime	1-2g every 8 hours[7,8]
Ceftazidime-avibactam	2.5g (infused over 2 hours) every 8 hours[9-11]
Ceftolozane-tazobactam	1.5g every 8 hours[12]
Ceftriaxone	1-2g daily[13,14]
Ertapenem	1g daily[14]
Fosfomycin	6g every 8 hours[15]
Imipenem-cilastatin	500mg every 6 hours[11,16] 1g every 8 hours[5]
Imipenem-cilastatin-relebactam	500mg/125mg every 6 hours[16]
Meropenem	1g every 8 hours[13,17]
Meropenem-vaborbactam	2g/2g (infused over 3 hours) every 8 hours[18]
Piperacillin-tazobactam	4.5g every 8 hours[3,15,18]
Plazomicin	10-15mg/kg daily[17,19]
Table 2.1 includes IV dosing for cUTI based on review of randomized controlled trials among patients with complicated UTI.	

C. Selection of Definitive Antibiotic Therapy for Complicated UTI

In patients with microbiologically confirmed cUTI, should definitive effective antibiotic therapy be targeted based on the results of urine culture rather than continuing empiric broad-spectrum antibiotics?

Recommendation:

I. In patients with confirmed complicated UTI, we suggest selecting a definitive effective antibiotic with a targeted spectrum based on the results of urine culture (identification and susceptibility) as soon as these are available, rather than continuing empiric broad-spectrum antibiotics for the complete duration of treatment (*conditional recommendation, low certainty of the evidence*).

Comment:

-This recommendation places a high value on de-escalating antibiotic therapy based on culture results (stewardship considerations) while optimizing the effectiveness of therapy (improving clinical cure and reducing recurrence of infection). De-escalation may be less practical in cases of cUTI managed in the outpatient setting.

Timing of Intravenous to Oral Antibiotics Transition for Complicated UTI

In patients who are being treated parenterally for cUTI, are clinically improving, can take an oral medication and for whom an oral option is available, should parenteral therapy be transitioned to oral rather than continued for the complete duration of therapy?

Recommendations

I. In patients with complicated UTI (including acute pyelonephritis) treated initially with parenteral therapy who are clinically improving, able to take oral medication, and for whom an effective oral option is available, we suggest transitioning to oral antibiotics rather than continuing parenteral therapy for the remaining treatment duration (*conditional recommendation, low certainty of the evidence*)

Comments:

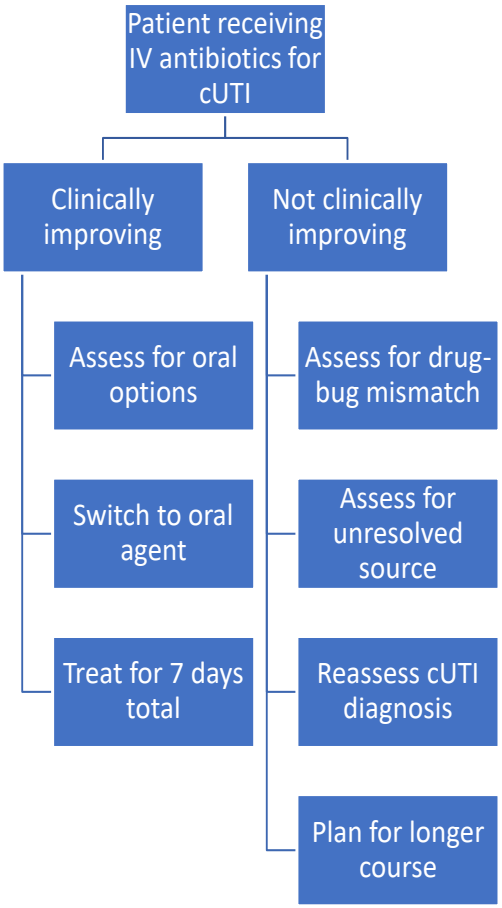
- This recommendation places a high value on reducing avoidable intravenous catheter-related adverse events, costs, and resources, as well as taking into account practical aspects of antibiotic administration.
- The trials supporting this recommendation mostly excluded patients with indwelling urinary catheters, sepsis or septic shock, immunocompromised states, severe renal insufficiency, and functional or structural abnormalities of the urinary tract. Some patients in these subpopulations may need an individualized plan of therapy.
- An effective antimicrobial agent means that the antibiotic achieves therapeutic levels in the urine and relevant tissue and is active against the causative pathogen.
- Refer to **Figure 1.2** for a stepwise assessment of the intravenous to oral switch and the duration of antibiotic therapy.

II. In patients presenting with complicated UTI (including acute pyelonephritis) and associated Gram-negative bacteremia treated initially with parenteral therapy who are clinically improving, able to take oral medication, and for whom an effective oral option is available, we suggest transitioning to oral antibiotics rather than continuing parenteral therapy for the remaining treatment duration (conditional recommendation, very low certainty of the evidence).

Comments*:*

- The trials supporting this recommendation mostly included patients who were afebrile, hemodynamically stable, and had achieved source control (relief of any urinary obstruction) before transitioning to oral antibiotics.
- An effective antimicrobial agent for bacteremic patients means that the antibiotic achieves therapeutic levels in the bloodstream, urine, and relevant tissue and is active against the causative pathogen.
- Refer to **Figure 1.2** for a stepwise assessment of the intravenous to oral switch and the duration of antibiotic therapy.

Figure 1.2: Stepwise assessment of IV to oral switch and duration of antibiotic therapy



Abbreviations: IV=intravenous, cUTI=complicated UTI. Drug-bug mismatch means that the causative organism is not susceptible to the antibiotic prescribed.

Table 1.2: Dosing of oral antibiotics for complicated UTI (in alphabetical order)			
Drugs	**Oral absorption (%)**	**Urinary excretion (%)**	**Dose for patients with normal renal function**
Amoxicillin-clavulanate	80 (amoxicillin)[22] variable (clavulanate)[23]	50-70 (amoxicillin)[22] 25-40% (clavulanate)[22]	875mg-125mg every 8 to 12 hours[24-32] Other regimens may be more effective[a]
Cefixime	50[33]	50[33]	400mg once daily[34]
Cefpodoxime	50[33]	80[33]	200mg to 400mg every 12 hours[31,35,36]
Ceftibuten	75-90[33]	73[33]	9mg/kg daily (children)[b] 400mg daily or 200mg every 12 hours (adults)[37,38]
Cefuroxime	52[33,39]	90[33,39]	500mg every 12 hours[31,40]
Cephalexin	90[33]	90[33]	500mg to 1000mg every 6 hours[24-29,32,41,42] Other regimens may be more effective[a]
Ciprofloxacin	70[43]	40-50[43]	500mg to 750mg every 12 hours [28,31,41,44,45]
Levofloxacin	99[46]	64-100[46]	500mg to 750mg daily[19,36,41,45]
Other oral beta-lactams (e.g. amoxicillin, cefadroxil, cefaclor, cefdinir)	Comparative clinical outcomes data vs highly bioavailable oral alternatives are more limited and/or discouraging; consider use with infectious disease pharmacist consultation if alternatives are not available.		
Trimethoprim-sulfamethoxazole	70-90[47]	84 (sulfamethoxazole), 66 (trimethoprim)[47]	800mg-160mg every 12 hours[31,44]

Duration of Antibiotics for Complicated UTI

In patients presenting with complicated UTI (cUTI) with a clinical response to therapy, should total duration of antibiotics be prolonged to >7 days rather than shorter (<=7 days)?

Recommendations:

I. In patients presenting with complicated UTI (including acute pyelonephritis) and who are improving clinically on effective therapy, we suggest treating with a shorter course of antimicrobials, using either 5-7 days of a fluoroquinolone (conditional recommendation, moderate certainty of evidence) or 7 days of a non-fluoroquinolone antibiotic (*conditional recommendation, very low certainty of evidence*), rather than a longer course (10-14 days).

Definitions:

- An effective antimicrobial agent achieves therapeutic levels in the urine and relevant tissue and is active against the causative pathogen.
- The duration of therapy is counted from the first day of effective antibiotic therapy.

Comments:

- Most studies supporting this recommendation excluded patients with indwelling urinary catheters, severe sepsis, immunocompromising conditions, abscesses in the urinary tract, chronic kidney disease, bacterial prostatitis, complete urinary obstruction, or undergoing urologic surgical procedures. Some patients in these subpopulations may be at higher risk for complications or treatment failure and may need an individualized duration of therapy.
- Men with febrile UTI in whom acute bacterial prostatitis is suspected may benefit from a longer treatment duration (i.e., 10-14 days), although evidence to guide the optimal duration in this subgroup is lacking.
- This recommendation is driven by evidence from trials that primarily studied fluoroquinolones during a time when fluroquinolone resistance was less common. Evidence for short courses of oral beta lactams in cUTI is more limited, and higher doses may be required for efficacy.
- Consider evaluation for an ongoing nidus of infection requiring source control in patients who do not have prompt clinical improvement.
- This recommendation places a high value on antibiotic stewardship considerations as well as reducing the burden of antimicrobial administration from a healthcare perspective and reducing the burden of taking antibiotics from a patient perspective.
- Refer to **Figure 1.3** for a stepwise assessment of the intravenous to oral switch and the duration of antibiotic therapy.

II. In patients presenting with complicated UTI with associated Gram-negative bacteremia and who are improving clinically on effective therapy, we suggest treating with a shorter course (7 days) of antimicrobial therapy rather than a longer course (14 days) (*conditional recommendation, low certainty in the evidence*).

Definitions:

- An effective antimicrobial agent for bacteremic patients means that the antibiotic achieves therapeutic levels in the bloodstream, urine, and relevant tissue and is active against the causative pathogen.
- The duration of therapy is counted from the first day of effective antibiotic therapy.

Comments:

- Men with febrile, bacteremic UTI in whom acute bacterial prostatitis is suspected may benefit from a longer treatment duration (i.e., 10-14 days), although evidence to guide the optimal duration in this subgroup is lacking.
- Consider evaluation for an ongoing nidus of infection requiring source control in patients who do not have prompt clinical improvement.

- This recommendation places a high value on antibiotic stewardship considerations as well as reducing the burden of antimicrobial administration from a healthcare perspective and reducing the burden of taking antibiotics from a patient perspective.
- Refer to **Figure 1.3** for a stepwise assessment of the intravenous to oral switch and the duration of antibiotic therapy.

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